Methadone Maintenance:

A Cost-effective Health Care Intervention

Paul G. Barnett

Health Economics Resource Center

Center for Health Care Evaluation

Veterans Affairs Health Care System

Palo Alto, California

A Report From the Substance Abuse Module,

Quality Enhancement Research Initiative (QUERI)

QSAMREP2.methadone.doc
HSRD; 9/29/99

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Executive Summary

Background. The VA cares for a substantial number of patients who are dependent on opiates. Methadone maintenance has been shown to be an efficacious treatment for these individuals, but the use of this treatment is controversial and its cost-effectiveness is unknown.

Objective. Cost-effectiveness analysis using life-years of survival as the measure of treatment benefit is widely used in the economic evaluation of health care interventions but has not been applied to substance abuse treatment. The cost-effectiveness of methadone maintenance was evaluated to demonstrate the feasibility of applying this method to substance abuse treatment.

Method. A literature review was undertaken to determine the effect of methadone treatment on the rate of mortality associated with opiate addiction. Information was obtained on the average cost and duration of treatment. A two-state Markov model was used to estimate the incremental effect of methadone treatment on the life span and treatment cost of a cohort of 25-year-old heroin users.

Results. Providing opiate-dependent individuals with access to methadone maintenance has an incremental cost of $5,915 per life-year gained. Sensitivity analyses determined that the cost was less than $10,000 per life-year gained over a wide range of assumptions.

Conclusions. The cost-effectiveness ratio determined for methadone maintenance is lower than that for many common medical therapies, and considerably below the $50,000 threshold for identifying cost-effective health care interventions. The methods described in this report make it possible to compare substance abuse treatment enhancements to other improvements in health services offered to individuals with substance use disorders.

Recommendations. The current scarcity of methadone programs in VA is resulting in unnecessary deaths in the veteran population. VA should expand access to methadone maintenance, as it is a highly cost-effective treatment for patients who are dependent on opiates. VA decision makers may need additional information on the financial consequences of expanded access in order to implement this recommendation.

Introduction

Methadone maintenance is a particularly important focus for cost-effectiveness research in the VA. Methadone maintenance has been shown to reduce heroin use, mortality, crime, unemployment, and the contraction and transmission of HIV (Ball & Ross, 1991; Dole et al., 1982; Ling et al., 1976; Marsch, 1998; McLellan et al., 1995; Newman & Whitehill, 1979; Stimmel & Rabin, 1974). With the rapid conversion of VA substance abuse treatment from an inpatient to an outpatient emphasis, methadone maintenance may have an even more central role in VA substance abuse care. In FY98, 7,400 patients had almost 824,000 contacts with VA methadone maintenance clinics, and these numbers have been increasing at an annual rate of about 8% in recent years (Piette, Bursden, & Moos, 1999). At the same time, methadone maintenance is available at only 34 VA facilities, and some methadone programs are closed to any new patients (Hamilton & Humphreys, 1996)..

VA policymakers are concerned with the cost-effectiveness of substance abuse treatments. They need to decide how to use scarce resources in a way that yields the greatest benefit.

Innovations that reduce health care costs and improve outcomes should be implemented, but decision makers are more commonly faced with the question of whether an intervention that increases costs and improves outcomes should be adopted. For example, policymakers may need to decide if psychosocial enhancements to treatment, more highly trained staff, or longer treatments are justified. In each case, the decision maker wants to know if the increase in effectiveness is sufficient to justify its cost. This requires that a value be set on the increase in effectiveness.

Cost-effectiveness and Cost-benefit Analyses

Cost-effectiveness analysis has been adopted as the standard method for evaluating new medical care interventions, such as drugs, medical devices, and diagnostic technologies. A federal task force has published guidelines on how it should be employed (Gold et al., 1996). This method compares a new intervention to standard care to determine its impact on cost and outcomes. Outcomes are expressed in terms of gain in life-years of survival, or gain in quality adjusted life-years of survival, and an incremental cost-effectiveness ratio is determined. Interventions that cost less than $50,000 per quality-adjusted life-year of survival typically are considered sufficiently cost-effective to justify their adoption.

To date, economic studies of substance abuse treatment have used cost-benefit analysis. A cost-benefit analysis translates all outcomes to dollars of value. A difficulty with this type of analysis is the need to estimate the dollar value of a year of human life. Although methods have been proposed for assigning a dollar value to quality adjusted years of survival (French et al., 1996), there is no universally accepted means of doing so. Cost-effectiveness analysis avoids this issue by using years of life as the outcome measure.

Under certain conditions, cost-benefit analysis and cost-effectiveness analysis will yield the same result. This occurs when identical items are included as costs and benefits, and if the dollar value assigned to a year of life in the cost-benefit analysis is exactly equal to the dollar value used as the threshold for evaluating the cost-effectiveness ratio, e.g., $50,000 per quality-adjusted year of life.

Cost-benefit Studies of Substance Abuse Treatment

In actual practice, cost-benefit studies of substance abuse treatment have included different benefits than are used in the standard cost-effectiveness method for health care interventions. An important benefit excluded from many studies of substance abuse treatment is the effect of treatment on life years of survival.

This exclusion stems from the design of most economic studies of substance abuse treatment, which have estimated the impact of treatment by comparing posttreatment behavior to a baseline survey. This comparison is used to find out how treatment reduces the costs that addicted individuals impose on the health, welfare, and criminal justice systems, and the reduction in losses due to property theft and other crimes (Berger & Smith, 1974; Gerstein et al., 1995; Harwood et al., 1995; Maidlow & Berman, 1972; Scanlon, 1976). The study design considers death as a loss to follow-up, rather than an outcome to be measured.

Studies that use this method have found reduced property theft to be the principal benefit of treatment. Three studies with very high benefit-to-cost ratios made strong assumptions about the ability of treatment to reduce criminal behavior (Berger & Smith, 1974; Maidlow & Berman, 1972; Scanlon, 1976). More modest ratios were found in studies that used survey data to estimate the effect of treatment on criminal behavior (Gerstein et al., 1995; Harwood et al., 1995).

To the extent that these studies have valued the effect of treatment on health, they have largely limited this consideration to the effect of treatment on patients' earned income. Such an approach understates the value of treatment, however, because it assigns no value to the lives of those who do not work for wages, including individuals who are retired, homemakers, students, disabled, or unemployed.

Failure to consider the effect of treatment on the length of life may understate the value of treatment and lead to a "mortality paradox." This can occur when the measurement of treatment benefits is limited to changes in social costs that individuals with substance use disorders impose on society. Treatment reduces, but does not eliminate the net cost imposed by these individuals. Death eliminates this burden. An analysis that does not value years of survival or quality of life is likely to find the intervention with the highest rates of mortality to be the most cost-effective.

Issues Addressed

This report includes length of life as a benefit in an economic analysis of substance abuse treatment. Its goal is to demonstrate that standard methods of cost-effectiveness developed for medical care interventions can also be applied to substance abuse treatment. Information on the cost and effectiveness of methadone maintenance is presented as the example.

> The first part of the report discusses the literature on mortality among individuals who abuse opiates by injection. It describes sources of information that can be used to estimate the incremental effect of methadone maintenance compared to other types of treatment.
>
> The report then uses this information to create a model that estimates the lifetime cost and benefit of providing access to methadone treatment. The robustness of the model is evaluated with sensitivity analyses.
>
> Finally, there is a discussion of the implications of the results for funding methadone programs and for future economic analyses of substance abuse treatment.

The Effect of Treatment on Mortality Among Injection Users of Opiates

The ideal way to determine the incremental cost-effectiveness of methadone maintenance compared to drug-free treatment is a controlled clinical trial. Patients would be randomized to a program of methadone maintenance or a standardized drug-free treatment. The trial would compare treatment, health care, and indirect costs incurred by all participants, and compare their rates of death. The incremental effect of methadone would be the difference in cost and outcomes, with outcomes expressed as a number of life-years of survival. The cost-effectiveness ratio, the difference in cost divided by the difference in years of life, would be estimated to determine if it is significantly less than $50,000 per quality-adjusted life-year.

Such a trial is not possible, as it is ethically unacceptable to conduct a study in which some participants are denied access to a life-saving treatment. There is, however, a substantial literature on the mortality rates associated with opiate addiction (Table 1). This literature was reviewed to estimate the incremental effect of methadone compared to drug-free treatment.

Mortality Among Minimally Treated Opiate Users

There is little information on the long-term mortality of opiate addicted injection drug users who do not have access to methadone. Published mortality rates for opiate dependent individuals usually include some effect of methadone. A 10-year follow-up of injection drug users who had detoxified from opiates in New York City hospitals after 1986 found a 3.03% annual mortality rate (Des Jarlais et al., 1994). This might be used as the mortality rate among individuals who lack access to methadone. However, it is likely that some deaths in the group were prevented by the availability of methadone treatment.

Historical data represent an alternative source of information. A study of individuals detoxified from opiates in New York City before methadone became available found an 8.25% annual death rate (Gearing & Schweltzer, 1974). Sweden ceased new enrollments in methadone between 1979 and 1984. Opiate-dependent individuals treated with drug free methods during this period had a 7.2% annual death rate.

Mortality Among Individuals in Methadone Treatment

Opiate users treated in methadone maintenance programs have much lower rates of death. As shown in Table 1, follow-up studies of individuals retained in methadone programs found mortality rates that varied from a low of .56% per year to a high of 1.5%. The effect of methadone on mortality cannot be estimated from the rates of death of individuals who continue in treatment, however. An unbiased analysis of effectiveness must include the outcomes of individuals who do not comply with treatment (Lavori, 1992). The appropriate way to gauge the mortality rate among individuals with access to methadone is follow all patients, including both those who drop out or are discharged as well as those who are retained in treatment. This is often referred to as an “intent to treat” analysis.

Only a few studies have taken this “intent to treat” perspective and followed all patients who enrolled in methadone treatment. The few that have taken this approach have found annual mortality rates that range from a low of 1.1% (Caplehorn et al., 1994) to a high of 2.9% (Segest, Mygind, & Bay, 1990). The low rate was in Australia, in a program that used high methadone doses and allowed indefinite stays. The high rate was in Denmark, where restrictions on methadone are reported to limit its efficacy (Segest et al., 1990).

Table 1. Effect of Methadone Maintenance on Mortality

Type of Cohort	Cohort Size	Location	Time	Annual Mortality Rate
Minimally Treated Individuals				
Hospital detox (methadone)[1]	141	New York	1984-92	3.03
Hospital detox (methadone)[2]	109	New York	1965	8.25
Periodic detox (methadone)[3]	115	Sweden	1979-84	7.20
Individuals who Drop Out of Methadone Treatment				
Dropouts from high dose program[4]	213	Australia	1970-90	1.58
Dropouts from pioneer program[2]	850	New York	1964-68	2.82
Voluntary discharge[3]	34	Sweden	1979-84	1.65
Dropouts[3]	53	Sweden	1979-84	6.91
DARP 4 year postdischarge follow-up[5]	1,529	U.S.A.	1973-79	1.80
Individuals who Enter Methadone Treatment				
High dose, indefinite stay program[4]	305	Australia	1970-90	1.11
Restrictions on methadone use[6]	169	Denmark	1978-86	2.90
Swedish study[3]	166	Sweden	1979-84	2.60
Individuals who Continue in Methadone Treatment				
High dose, indefinite stay program[4]	305	Australia	1970-90	0.56
Pioneer methadone program[2]	3,000	New York	1964-68	0.76
Pioneer methadone program[7]	489	New York	1969-76	1.02
Swedish study[3]	166	Sweden	1979-84	1.40
DARP[8]	25,296	U.S.A.	1970-73	1.50

Note. [1]Des Jarlais et al., 1994; [2]Gearing & Schweitzer, 1974; [3]Gronbladh et al., 1990; [4]Caplehorn et al., 1994; [5]Joe et al., 1982; [6]Segest et al., 1990; [7]Concool et al., 1979; [8]Watterson et al., 1975.

Differential Mortality Associated With Access to Methadone

The two studies that include information on death among opiate users before methadone became available provide direct comparison to mortality rates associated with methadone. Individuals who did not have access to methadone had an 8.25% annual mortality rate which is 6.8 times the mortality rate of individuals who entered the pioneer methadone treatment programs in New York City (Gearing & Schweitzer, 1974).

A second study also compared two groups of individuals addicted to heroin with different access to methadone (Gronbladh, Ohlund, & Gunne, 1990). This comparison was made possible by the Swedish policy that prohibited new enrollments in methadone between 1979 and 1984. One group included individuals who met the criteria for enrolling in methadone maintenance, but were denied access by the policy. Although they did not have access to methadone, these individuals did obtain periodic detoxification and drug-free treatments. The other group consisted of comparable individuals previously enrolled in methadone treatment. Their treatment was not affected by the policy.

Over the next 8 years, 48 of the 115 individuals in the group that did not have access to methadone died. This was 63 times the expected rate of death rate for individuals of the same age. Of the individuals with access to methadone, 48 of 166 died. Although the Swedish researchers did not report the relative risk of this entire group, they provided sufficient data to determine that its members had 12 times the expected death rate. The drug-free treatment group thus had 5.2 times the risk of death of individuals with access to methadone. In the absence of a trial randomizing patients to methadone or drug-free treatment, this study represents a randomization by public policy, and thus provides unique information on the incremental effect of methadone treatment on mortality.

Differential Mortality Associated With Treatment Retention

Another approach to estimating the effect of methadone on survival has been to compare the death rates of persons retained in treatment to those who drop out. A study of some of the first patients in methadone maintenance found that the annual mortality rate of those who left treatment was 2.8%, or 3.5 times the rate of those who remained in treatment (Gearing & Schweizer, 1974). A 20-year follow-up of an Australian methadone maintenance program found that dropouts had a mortality rate of 1.6%, or 2.9 times the rate of those who remained in treatment (Caplehorn et al., 1994).

These differences do not necessarily represent the incremental effect of treatment, however. Individuals who drop out of treatment may be different from those who remain, and the difference in death rates may reflect some of these differences. In addition, it has been reported that the reduction in the risk of death is greatest during the initial months of treatment; the reduction in later months is not as great (Caplehorn et al., 1994). Using patients who have terminated treatment as a comparison group may thus understate the value of methadone, as these individuals may have already received much of the benefit associated with treatment .

Model Development

A model was developed to estimate the cost-effectiveness of methadone maintenance compared to drug-free treatment of opiate dependence. A two-state Markov model was used to estimate the incremental effect of methadone maintenance on mortality. The model was used to estimate the life span of a cohort of 25 year-old heroin addicts with access to methadone treatment. This age was chosen because it was the median age of persons entering methadone treatment in the United States (Joe, Lehman, & Simpson, 1982).

Estimation of Mortality Rates

Mortality rates were found using age-specific death rates for the normal population obtained from United States life tables. It was assumed that addicted individuals with access to methadone treatment have the 12 fold greater risk of death observed in the Swedish study. The model started with a hypothetical cohort of 1,000 individuals of 25 years of age. The annual death rate among 25 year old individuals is 0.123%. With 12 times the normal risk of death, the death rate becomes 1.5%, and 15 deaths would occur in the first year. The death rate for 26 year old individuals, also calculated as 12 times the normal rate, was applied to the 985 survivors, to find the number of deaths in the next year. This was done sequentially until there were no survivors. Altogether, the cohort of 1,000 individuals experienced 23,928 years of life. This estimate includes partial years of life spent by individuals in the year of their death.

This same method was used to determine the survival of heroin addicted individuals not in methadone maintenance. It was assumed that individuals with access to drug-free treatment, but not methadone, would have 63 times the normal rate of death, the figure found in the Swedish study. This cohort of 1,000 individuals experienced 9,158 years of life. Table 2 summarizes the results of the model. The incremental benefit of access to treatment is the 14,770 additional years of life.

Table 2. Model of Incremental Effect of Methadone Treatment on Survival

	Methadone Treatment		Drug-Free Treatment			
Age	Number Alive at Beginning of Period	Years of Life During Period	Number Alive at Beginning Period	Years of Life During Period	Difference in Years of Life During Period	Methadone Rx Cost in Thousands of Dollars
25-29	1,000	4,819	1,000	4,115	703	15,179
30-34	928	4,432	668	2,617	1,815	13,961
35-39	846	3,983	401	1,461	2,521	12,546
40-45	749	3,471	205	684	2,787	10,933
45-49	642	2,862	86	234	2,629	9,016
50-54	508	2,138	22	44	2,094	6,734
55-59	356	1,345	2	3	1,342	4,237
60-64	198	641	0	0	641	2,018
65 and older	77	238	0	0	238	748
Total		23,929		9,158	14,770	75,372
Present value of total (3% discount rate)		16,345		7,641	8,704	51,486

Baseline Cost-effectiveness Model

The model was also used to estimate the lifetime cost of access to methadone maintenance. Patients with access to methadone in the Swedish study received methadone during 57.5% of the follow-up period. The model was constructed with the assumption that those in treatment would receive methadone for 60% of their remaining life. Methadone maintenance therapy costs an average of $437 per month (all costs are expressed in 1996 U.S. dollars), or $5,250 per year (Barnett & Rodgers, in press).

Given these assumptions, a 25-year old person with access to methadone would receive 14.6 years of treatment, at a lifetime cost of $75,372. In the Swedish study, both groups had access to drug-free treatment and periodic detoxification, but no data were available on the amount of this treatment they received. It was assumed that the groups made equal use of this treatment, an assumption discussed more fully below.

Economic analysis must consider time preferences, the basic economic axiom that explains why it is better to be given a dollar today than a dollar a year from today. To account for time preference, cost-effectiveness analysis considers costs and benefits in terms of their present value to the decision maker. Both future costs and benefits must be discounted. A 3% discount rate has been proposed as the standard rate for economic analysis of health care (Gold et al., 1996).

With a 3% discount rate applied, the present value of the cohort's treatment was $51.5 million and the present value of the incremental benefit of treatment was 8,704 years of life, a cost-effectiveness ratio of $5,915 per year of life gained. This ratio is well within the $50,000 per quality-adjusted life-year threshold used to judge health care interventions.

Sensitivity Analyses

This section considers whether the results just described depend on the assumptions made to construct the cost-effectiveness model. As just noted, the baseline model assumes that (1) individuals addicted to opiates have 12 times the normal mortality rate if they have access to methadone and 63 times the normal rate if they do not have access, (2) individuals who do not have access to methadone have 5.25 times the mortality rate of individuals who do have access, (3) the relative risk of mortality is constant across all ages, (4) the individual is 25 years old when treatment begins, (5) the annual cost of treatment is $5,250, (6) individuals spend 60% of their remaining life in treatment, and (7) treatment is spread uniformly throughout the individual's life. Also, (8) a 3% discount rate was used. The results of these sensitivity analyses appear in Table 3. The assumptions used to model mortality are considered first.

Table 3. Baseline Cost-effectiveness Model and Sensitivity Analyses

Model	Cost-effectiveness Ratio (Dollars per year of life gained)
Baseline cost-effectiveness model	$5,915
Sensitivity Analyses	
7 times normal mortality risk with access to methadone	5,275
22 times normal mortality risk with access to methadone	7,513
Those with no access to methadone have 2.9 times the mortality risk of those with access to methadone	9,103
Relative risk for those over 30 years of age is half the risk of those under 30 years of age	5,991
20 years old when treatment begins	6,093
30 years old when treatment begins	5,630
$3,800 annual costs while in treatment,	4,282
$6,710 annual costs while in treatment	7,561
35% of remaining life in treatment	3,451
63% of remaining life in treatment	6,251
All treatment provided at outset	6,298
5% discount rate	6,531

Varying Estimates of Mortality Rates. The first issue is whether the mortality rates of individuals who entered methadone treatment in the Swedish study are representative of individuals in other methadone programs. The 12 fold additional risk for mortality was compared to the risk found in other studies that followed all individuals treated in methadone. These other studies reported their results as an annual mortality rate, while the model requires information on the additional risk of mortality compared to individuals of the same age. For studies that did not report relative risk, it was estimated by comparing the observed number of deaths to the number of deaths expected in the same size cohort, followed for the same number of years, given the mean age of individuals in the study and the mortality rates of the general population.

The model was constructed with the 12 fold risk observed in the Swedish study. Using an estimate of 7 times the risk, a risk consistent with the mortality rate reported in the Australian study (Caplehorn et al., 1994), the cost-effectiveness ratio was $5,275 per life year. The extra protective effect of methadone leads to a lower (more cost-effective) ratio than the base case. Using the estimate that individuals treated with methadone have 22 times the risk of death observed in the general population, the risk consistent with the rate reported in the Danish study (Segest et al., 1990), the cost-effectiveness ratio was $7,513.

Varying Access. The second issue is whether treated individuals who lack access to methadone maintenance have the same mortality rates as in the Swedish natural experiment. The Swedish individuals who received drug-free treatment but did not have access to methadone had an age adjusted risk of mortality that was 5.2 times that of those with access to methadone. The only other historical comparison is of opiate users in New York City, who had 8.25 times the mortality rate of the individuals in the pioneer methadone programs.

The alternative estimate to these historical observations is to compare treatment dropouts to individuals retained in treatment. Despite the potential for bias, such comparisons are the only alternative to historical data. The most conservative of these comparisons is the Australian follow-up study, which found that individuals who dropout of treatment had 2.9 times the mortality risk of those who were retained. Applying this relative risk to the model yields a cost-effectiveness ratio of $9,103.

Varying Estimates of Risk by Age. The third issue is whether results are sensitive to the assumption that the additional risk of mortality in each cohort is constant across all age groups. The relative risk of death appears to vary with age. A 22-year follow-up of opiate users in England found the relative risk of death to be highest among younger users (Oppenheimer et al., 1994). A U.S. study of opiate users discharged from treatment found that those younger than 30 had 10.1 times the expected rate of death, whereas those over 30 had only 4.4 times the expected death rate (Joe, Lehman, & Simpson, 1982). A longer follow-up of part of this same cohort found smaller variation with age (Joe & Simpson, 1987).

An alternative model was created by using the risks of the base case for individuals under 30 years of age, but assuming that the additional risk of death is half as great after 30. An exponential function was created to model the change in relative risk as a smooth transition, rather than a discrete change. With this change, the cost-effectiveness ratio was $5,991 per year of life gained, essentially unchanged from the baseline model.

The baseline model was created on a cohort of 25 year-old opiate users. The model was re-estimated to determine if the results are robust for other age cohorts. A cohort of 20 year olds had a cost-effectiveness ratio of $6,093 per life year; for 30 year-olds, the ratio was $5,630 per life year.

Varying Estimates of Treatment Costs. Sensitivity analysis was also conducted to consider assumptions about the annual cost of treatment, the lifetime cost of treatment received, and the timing of treatment. The baseline model uses an annual cost of treatment that is based on a methadone program with average characteristics. This $5,250 annual cost is consistent with other studies. An evaluation of the cost of three methadone programs found annual costs that ranged from $4,500 to $5,280 (Bradley, French, & Rachal, 1994).

To provide a population-based range of program costs, the average annual cost of treatment was determined from the U.S. National Drug and Alcohol Treatment Unit Survey (SAMHSA, 1992). When programs that offered methadone maintenance and no other treatment were ranked, programs at the 75th percentile had costs that were 1.28 times the median and 1.78 times the cost of programs at the 25th percentile. This range of values corresponds to a range of annual costs from $3,800 to $6,710, which yield a range of cost-effectiveness ratios from $4,282 to $7,561 per year of life.

Individuals in the Swedish study with access to methadone spent 57.5% of the follow-up period in methadone treatment (Gronbladh et al., 1990). The baseline model was built with the assumption that opiate users would spend 60% of the remainder of their life in treatment. Other long-term follow-up studies have found that different levels of treatment were received.

A 20-year follow-up of an Australian treatment program found that individuals received methadone treatment over 46% of the follow-up period (Caplehorn et al., 1994). A study of patients admitted to three U.S. programs determined the amount of time spent in methadone treatment over the subsequent six years (McGlothlin & Anglin, 1981). On average, patients in a program providing flexible, high dose treatment, received treatment during 63.4% of the follow-up period; patients in a more restrictive, low-dose program, received treatment 35.0% of the time. Applying this range of estimates of the cost of treatment resulted in cost-effectiveness ratios ranging from $3,451 to $6,251. This change in the model reflects only the effect of the differences in these programs on treatment cost; information on their effect on mortality was not available.

The baseline model was built using the assumption that methadone treatment was obtained in intervals that were spread out equally over the remainder of the patient's life-span. It is possible that more of the treatment may be obtained when the patient is young. If this were the case, the present discounted value of treatment is understated; that is, treatment provided sooner has a greater economic cost than treatment that is delayed. The sensitivity of results to the timing of treatment was evaluated by modeling with the assumption that all treatment occurs at the outset, and that treatment ends when 60% of the remaining lifespan is complete. This change in the modeling assumption had little effect, generating a cost-effectiveness ratio of $6,298 per life year.

Varying the discount rate. The baseline model used a 3% discount rate. Use of a 5% discount rate (the alternative "standard" discount rate) resulted in a cost-effectiveness ratio of $6,531 per year of life.

Comment

Several refinements could be made to the calculation of the cost-effectiveness ratios presented in this report.

Use of Health Care Resources

It was assumed that methadone maintenance and drug-free treatment groups would make the same use of health care resources, and the same use of non-methadone treatment services. To provide more precise estimates, future analyses need to obtain information about the effect of methadone access on use of these other services.

The effect of these assumptions is uncertain. Methadone maintenance causes a substantial reduction in the chances of contracting the HIV virus (Metzger et al., 1993). The lifetime cost of treating a person with HIV from the time of infection until death is $119,000 (Hellinger, 1993). On the other hand, because methadone prolongs life, treated individuals can survive to incur additional costs for treatment of other conditions. There is considerable controversy about whether cost-effectiveness analysis should include the cost of treating unrelated diseases that occur in the added years of life (Garber et al., 1996).

A cost-effectiveness analysis from the perspective of society should also consider the impact of treatment on the costs of public programs, such as the criminal justice and welfare systems. The literature on cost-benefit analysis suggests that reduction in the cost of these programs would offset much of the cost of treatment.

Indirect Costs of Treatment

Information on the indirect cost of treatment borne by the patient is also needed. This includes the cost of transportation and the value of the time lost traveling to treatment. Since at present methadone maintenance involves daily visits to a clinic, these costs are significant. The cost of travel and time spent in clinic may be important when comparing the cost-effectiveness of methadone to other therapies. For example, the alternate-day dosing regimen of Levo-Alpha Acetylmethadol (LAAM) would be expected to reduce these indirect costs by as much as half.

Updated Mortality Rates and Adjustments for Quality of Life

The cost-effectiveness ratio would be more accurate if more recent mortality data were available. The mortality studies cited in this report may not reflect contemporary mortality rates, as affected by the current rate of AIDS-related deaths. Therefore, the model may understate the ability of methadone to prolong life. In addition, the model does not consider the effect of preventing HIV transmission on the lives of individuals who are not treated with methadone, that is, the needle-sharing and sexual partners of treated injection drug users.

The cost-effectiveness ratio could be further refined by adjusting years of survival for the quality of life. The comorbidities of opiate addiction, such as AIDS, hepatitis, endocarditis, and cellulitis, represent a diminution of the quality of life that should be considered in estimating the benefit of treatment. In addition to these medical comorbidities, adjustment is needed to reflect the diminution of health due to addiction per se, and the effect of methadone treatment on quality of life. It must be acknowledged that such adjustments will be difficult. This subject is beyond the scope of this report.

Methadone Maintenance Versus Other Health Care Interventions

In the absence of these refinements, this project found that access to methadone maintenance yields additional years of survival at a cost of $5,250 each. While comparison of cost-effectiveness ratios found in different studies is fraught with problems, this value suggests that methadone compares quite favorably with other health care interventions as a relatively efficient means of producing health. For example, the incremental cost-effectiveness of bypass surgery compared to medical therapy for left-main coronary artery disease is $7,600 per year of life saved; medical therapy for severe hypertension has a ratio of $21,700 per life-year; and hemodialysis for chronic renal failure, $38,000 per life-year (in 1996 U.S. dollars) (Mark et al., 1995).

Comparing methadone to other interventions makes the assumption that the health care payer (or society) values the lives of all patients equally. If decision makers believe that a year of survival of a recovering opiate addict does not have the same value as a year of life of another member of society, then they will not want to compare the cost-effectiveness ratio for methadone to the ratios for interventions that benefit the general population.

Even for decision makers who believe that a comparison to the general population is not appropriate, however, cost-effectiveness analysis can help choose among alternatives designed to benefit opiate addicted individuals, such as other treatments for addiction, and other health care interventions. For example, enhanced psychological and social services have been shown to increase the effectiveness of methadone therapy (McLellan et al., 1993). Decision makers will want to know whether the additional benefit produced by these enhancements are worth their extra cost.

The cost-effectiveness ratio also allows methadone maintenance to be compared to other health care interventions provided to opiate addicts. Methadone maintenance appears to be more cost-effective than many AIDS therapies. Zidovudine had a median incremental cost of $41,500 per year of life gained (in 1996 dollars) (Moore et al., 1994). Other research has estimated that the cost-effectiveness ratio of low dose zidovudine is between $8,300 and $89,200 per year of life gained (Schulman et al., 1991). A strategy of using dapsone as the initial prophylaxis for pneumocystis carinii pneumonia has a cost-effectiveness ratio of $17,000 per year of life saved (Freedberg et al., 1991). Medicaid, the largest U.S. indigent health care program, funds these AIDS therapies, but, in many states, it does not support methadone maintenance. The cost-effectiveness ratio provides an objective standard to evaluate such policies.

Conclusions and Recommendations

Economic analysis of substance abuse treatment has relied heavily on the cost-benefit method. Cost-effectiveness methods widely applied to the study of new pharmaceuticals and other medical technologies should be applied to the field of substance abuse treatment. It is not necessary to assign a dollar value to measure the benefit of substance abuse treatment. Using survival as an outcome provides a common denominator that allows different treatment regimens to be compared to each other and to other medical care interventions. Additional studies using this type of analysis are needed if there is to be parity between medical care expenditures and the funding of treatment for substance use and other mental disorders.

Conclusions. This report has determined that methadone maintenance is a very cost-effective use of health care resources. This finding is subject to the limitations of the data and methods that were used. Efforts to provide a more accurate estimate of the cost-effectiveness of methadone maintenance are now underway.

The current distribution of VA methadone programs represents a natural experiment on the effect of access on health care cost and survival. The distance to the nearest VA methadone treatment program represents a kind of “experiment by policy” that can be used to accurately gauge the impact of expanded access. The Center for

Health Care Evaluation is studying a group of 10,000 veteran patients with opiate disorders to estimate the financial and health effects of expanded methadone access.

This report only considered the effect of access on the health of those in treatment. Methadone maintenance decreases the transmission of HIV, slowing the growth of the AIDS epidemic and conferring benefits beyond those who are in treatment. Working with researchers from Stanford University, the Center for Health Care Evaluation is creating a dynamic model of the HIV epidemic to incorporate these indirect effects of treatment into a cost-effectiveness analysis.

Preliminary results indicate that these refinements will not change the primary conclusion of this report: Methadone maintenance is a very cost-effective use of health care resources.

Policy Recommendations. Despite the value of methadone maintenance, it is not available at most VA facilities. Although VA operates more than 150 medical centers throughout the United States, it has licenses to dispense methadone for opiate substitution therapy at just 34 sites. A recent survey found that just 30 of 304 VA substance abuse treatment programs provide outpatient methadone maintenance treatment (Humphreys et al., 1998). (Four methadone programs were not included as they had fewer than 2 full-time staff positions, the minimum size of programs that were surveyed.) A 1996 survey found that two VA methadone programs were no longer admitting new patients (Hamilton & Humphreys, 1996).

Methadone should be more widely available in the VA. The current scarcity of methadone programs is resulting in unnecessary deaths in the veteran population. Methadone maintenance is a more cost-effective than other widely used medical care interventions in preventing avoidable deaths. Other Federal agencies are concerned that methadone treatment is too difficult to obtain. They have proposed relaxing the regulations that currently restrict the use of methadone (U.S. Department of Health and Human Services, 1999).

VA decision makers need information on the financial consequences of increased access to methadone maintenance. In addition to an increase in the direct cost of methadone programs, greater access may increase the rate at which HIV positive veterans receive expensive anti-retroviral medications. Lifetime health care costs can be expected to increase because expanded methadone access prolongs patients' survival. Another issue is whether expanded access will cause veterans who are cared for by other public agencies to seek more care from VA. Expanded access may also affect VA regional budget allocations. VA distributes funds among regions based on the number of veterans in each of three different casemix categories. Regional and local decision makers, who have the responsibility for deciding what services to offer, will want to know how expanded access will affect the number of patients in each casemix category, and whether the resulting change in funding will be sufficient to meet the cost of care.

Acknowledgements

This report was prepared for the Substance Abuse Module of the VA Quality Enhancement Research Initiative (QUERI). The research was supported by the Medications Development Division of the National Institute on Drug Abuse through interagency agreement 1-Y01 DA 40032; and by the Department of Veterans Affairs (VA) Health Services Research and Development Service and Cooperative Studies Program. The helpful comments of Rudolf Moos, Keith Humphreys, Ciaran Phibbs, and John Finney are gratefully acknowledged. An adapted version of this report was published in Addiction, 94(4), 479-488.

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